

# Global Invaders

Where aquatic nuisance species come from and how they get here



## Activity

Students map the travel routes of aquatic nuisance species from their native habitat to some of the regions where they have been introduced.

**Grade level:** 6-8

**Subjects:** Ecology, Geography, Science

**Setting:** Classroom

**Duration:** 1 class period

**Key Terms:** aquatic nuisance species, invasive species, introduction pathway, native, non-native

## Objectives

- Identify the origins and distribution of aquatic nuisance species that have been introduced to the United States and beyond.
- Investigate how aquatic nuisance species may be transported from one country to another.
- Exercise critical thinking skills to analyze common traits of locations where aquatic nuisance species are well established.

## Materials

- Laminated world map (supplied)
- Nuisance species cards (11 species, 42 cards total)
- Colored thumbtacks, colored yarn, tape

## Background

Every organism, whether it is a plant, animal or fungus, is considered a **native** species somewhere in the world. **Non-native** species are those species that have moved outside their natural range into an area where they would not normally be found. Those non-native species that cause harm to their new environment once they become established and spread quickly from their point of introduction are called **invasive** species. **Aquatic nuisance species** are non-native *aquatic* species that pose significant ecological and economic threats to *aquatic* ecosystems. Invasive species (including aquatic nuisance species) threaten the diversity and abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat. How did the first invasive plants and animals get to the United States? With the beginning of European settlement, many new species were brought over intentionally for food or agricultural crops, while others were introduced accidentally – brought in as stowaways on the ships that brought people and their supplies. Since the 1900's

increased travel and global trade has led to a dramatic increase in the number of invasive species introduced to the United States. Today, there are many different pathways through which invasive species are intentionally or unintentionally introduced. For invasive species, the term “**Introduction Pathway**” is used to describe the means by which a species travels from its natural habitat into a new one. A pathway can be either natural or man-made. Natural pathways like wind and water currents account for very few invasive species introductions. The vast majority of new invasive species introductions are caused by human actions.

The following is a list of some of the more common ways that aquatic nuisance species are introduced globally as well as locally.

### **1. Commercial shipping**

Ballast Water Discharge: large ships often fill the ballast tanks with ocean water to remain stable and neutrally buoyant during their journey. As a ship fills its ballast tanks it also loads many of the organisms living in the water including microscopic plants, pathogens, and animals as well as mussels, crabs and fish. Once the ship reaches its destination, the ballast tanks are discharged, releasing the water as well as the organisms in it.

Hull Fouling: organisms like barnacles, mussels, sponges and algae can attach themselves to the hulls of ships and “hitch a ride” from one port to the next. Invasions can occur when these organisms are scraped off in a new port or the adults release their larvae into the water.

- Ballast water discharge and hull fouling are responsible for the introduction and spread of zebra mussel, New Zealand mudsnail and Chinese mitten crab.

### **2. Recreational or Commercial Watercraft**

Boats, jet skis, boat trailers or any other recreational or commercial gear that is regularly in contact with water can move aquatic nuisance species from one water body to another. Aquatic nuisance species such as hydrilla and Didymo are easily transported when plant fragments attach to boat propellers, trailers and other gear.

### **3. Intentional stocking for food or recreation**

Many invasive fish species such as brook trout and Asian carp have been introduced for food and recreational fishing. The semi-aquatic nutria was introduced to the United States for trapping and fur production.

### **4. Accidentally released with other species in the plant and animal trade**

Aquatic plants purchased online may contain invasive hitchhikers such as seeds, plant fragments, snails, insects or fish. New Zealand mudsnail have been introduced accidentally through the transport of live fish or eggs for the commercial aquaculture industry.

## **5. Escape from farms or aquaculture facilities**

Atlantic salmon frequently escape from aquaculture facilities damaged by storms and other causes. Wild nutria populations have been established through accidental escapes from nutria farms.

## **6. Escape from nurseries and water gardens**

Aquatic nuisance species such as hydrilla, water hyacinth, Eurasian watermilfoil and purple loosestrife were originally sold as plants for water gardens and aquariums and have been introduced to new regions through release from personal aquariums or escape from private ponds.

## **7. Released as a biological control of an existing invader**

Non-native species (usually a predator, parasite or pathogen) may be purposefully introduced into an environment to reduce the population of an aquatic nuisance species. Invasive grass carp have been introduced to some locations to help control hydrilla and other aquatic weeds.

## **8. Intentional release of unwanted pets, classroom and laboratory animals**

Aquarium fish (e.g., goldfish) and invasive amphibians such as bullfrog and red-eared sliders are often released into local waterways when owners grow tired of caring for them. Red swamp crayfish (an invasive crustacean in the Pacific Northwest) are often sold to schools for classroom projects and subsequently released into the wild at the end of the science lesson.

## **9. Live fishing bait release**

The rusty crayfish is a popular live bait species that has been spread by anglers outside of its natural range.

## **10. Internet and mail ordering**

Many aquatic nuisance species such as red-eared sliders, American bullfrog and rusty crayfish can be purchased online from biological supply houses.

## **Preparation**

- Gather the appropriate number of *nuisance species cards* for the size of class. The deck contains 11 sets of cards (one set for each species) with 3-4 cards to a set. Each student should receive one card.
- Each set of cards has the name and picture of an Aquatic nuisance species on one side, plus a few sentences about the species on the other side. Within each set, one card has the native location of the organism (colored cards), and the rest have the organisms introduced locations (white cards).
- It is important that for each species used during the activity, the native location card and at least one introduced location card is given out.

## **Directions**

- Place the laminated world map up on the wall.
- Give each student one of the *nuisance species cards*.
- Allow the students to wander around the classroom and locate other students with the same nuisance species.
- Once groups are formed, each student within a group will share the information on their *nuisance species card* with the other students in their group.
- Following the group-share, each group will take turns presenting their organism to the rest of the classroom (i.e., its native distribution, the location(s) to which it has been introduced, how the species was introduced, why the species is considered a threat).
- The group will then plot both the native and introduced locations of their nuisance species on the map by attaching colored thumbtacks and yarn from point of origin to point(s) of introduction.
- At the end of the exercise, the map will be covered with lengths of yarn, showing how the organisms have traveled all over the globe.

## **Evaluation**

Wrap up the exercise by discussing the following questions:

- Many non-native species have been introduced to the United States through global trade and travel. Why do some organisms become invasive while others do not?
- What characteristics, if any, do the species that have been successful invaders share?
- Do organisms considered aquatic nuisance species in the United States always originate from another country?
- Why are certain regions within the United States more likely to receive an invasive species?
- Do the regions that have had introductions have habitat characteristics in common with each other or the native region?

## **Extensions**

- Students can explore the distribution pattern of an aquatic nuisance species in more detail. In addition to mapping the organisms global distribution, students might investigate the following:
  - How did the organism travel from its native region to introduced regions?
  - Why is this organism a problem?
  - What characteristics make the organism such a successful invader?
  - Are there longitude or latitude similarities in the distribution pattern of the organism? What does this mean?

## **Source**

This activity is an adaption of the Where in the World? lesson plan by Paul Heimowitz and Nancy Lerner, from “Exotic Aquatics on the Move”, a Washington Sea Grant Program publication.

## **Washington State Science & Environmental Science Standards:**

6-8 LS2D – Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of different species through disease, predation, habitat destruction and overuse of resources or the introduction of new species.

6-8 LS2E – Investigations of environmental issues should uncover factors causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.

6-8 LS3E – Adaptations are physical or behavioral changes that are inherited and enhance the ability of an organism to survive and reproduce in a particular environment.

ESE Standard 1 - Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

ESE Standard 2; The Natural and Built Environment – Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.